

ABSTRACT OF REPORT

ON

**DISINFECTION AND DISINFECTANTS.**

BY A

COMMITTEE APPOINTED BY THE

AMERICAN PUBLIC HEALTH ASSOCIATION.



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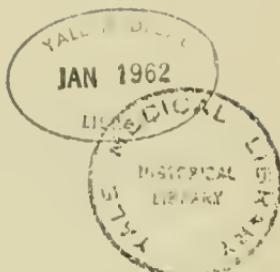
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184 At the Twelfth Annual Meeting of the American Public Health Association, held in St. Louis, a committee was appointed to examine the subject of Disinfectants, Antiseptics and Germicides in their relations to preventive medicine and sanitation, and to formulate a table of these agents for the information of those interested, the agents to be classified, so far as may be deemed advisable, according to their specific virtues, facility of application, and economy of use.\*

The following gentlemen composed the committee :

Dr. George M. Sternberg, Surgeon U. S. Army, Fellow by Courtesy in the Johns Hopkins University, Baltimore; Dr. Joseph H. Raymond, Professor of Physiology and Sanitary Science in Long Island College Hospital, and Health Commissioner of the city of Brooklyn; Dr. Victor C. Vaughan, Professor of Physiological Chemistry in the University of Michigan, and member of the Michigan State Board of Health; Major Charles Smart, Surgeon U. S. Army, and member of the National Board of Health; Dr. W. H. Watkins, Medical Director of the Auxiliary Sanitary Association of New Orleans; Dr. Albert R. Leeds, Professor of Chemistry in Stevens Institute of Technology, and member of the New Jersey State Board of Health; and Dr. George H. Rohé, Professor of Hygiene in the College of Physicians and Surgeons, Baltimore.

\* From the Financial Statement of the Committee, prefacing its final report, it appears that the American Public Health Association, the State Boards of Health of Connecticut, Illinois, Iowa, Massachusetts, Michigan and New York, and Messrs. H. Lomb and W. G. Little, contributed \$50 each; the State Boards of Louisiana, South Carolina and Wisconsin, the Provincial Board of Canada and the City Boards of Boston, Charleston and Pittsburg, \$25 each; the Brooklyn Board of Health, \$100; the Newport Sanitary Association, \$10: and members of the Committee, \$12.15—making the total expenses for laboratory investigations, compensation of assistants and publication of the Preliminary Report, \$747.15.

The full report makes an octavo volume of xi, 137 pages, of which only the conclusions reached by them from their experimental evidence is here published :

#### CONCLUSIONS.

The most useful agents for the destruction of spore-containing infectious material are :

1. *Fire.* Complete destruction by burning.
2. *Steam under pressure.* 110° C. (230° Fahr.) for ten minutes.
3. *Boiling in water* for one hour.†
4. *Chloride of lime.*‡ A 4 per cent. solution.
5. *Mercuric chloride.* A solution of 1 : 500.

For the destruction of infectious material which owes its infecting power to the presence of micro-organisms *not containing spores*, the committee recommends:

1. *Fire.* Complete destruction by burning.
2. *Boiling in water* half an hour.
3. *Dry heat.* 110° C. (230° Fahr.) for two hours.
4. *Chloride of lime.*‡ 1 to 4 per cent. solution.
5. *Solution of chlorinated soda.*§ 5 to 20 per cent. solution.
6. *Mercuric chloride.* A solution of 1 : 1000 to 1 : 4000.
7. *Sulphur dioxide.* Exposure for twelve hours to an atmosphere containing at least 4 volumes per cent. of this gas, preferably in presence of moisture.||
8. *Carbolic acid.* 2 to 5 per cent. solution.
9. *Sulphate of copper.* 2 to 5 per cent. solution.
10. *Chloride of zinc.* 4 to 10 per cent. solution.

The committee would make the following recommendations with reference to the practical application of these agents for disinfecting purposes :

#### FOR EXCRETA.

(a.) In the siek room :

For spore containing material,

1. Chloride of lime in solution, 4 per cent.

† This temperature does not destroy the spores of *B. subtilis* in the time mentioned, but is effective for the destruction of the spores of the anthrax bacillus and of all known pathogenic organisms.

‡ Should contain at least 25 per cent. of available chlorine.

§ Should contain at least 3 per cent. of available chlorine.

|| This will require the combustion of between 3 and 4 pounds of sulphur for every 1000 cubic feet of air space.

2. Mercuric chloride in solution, 1 : 500.\*

In the absence of spores,

3. Carbolie acid in solution, 5 per cent.

4. Sulphate of copper in solution, 5 per cent.

5. Chloride of zinc in solution, 10 per cent.

(b.) In privy vaults:

Mercuric chloride in solution, 1 : 500.†

(c.) For the disinfection and deodorization of the surface of masses of organic material in privy vaults, etc.:

Chloride of lime in powder.‡

#### FOR CLOTHING, BEDDING, ETC.

(a.) Soiled underclothing, bed linen, etc.:

1. Destruction by fire, if of little value.

2. Boiling for at least half an hour.

3. Immersion in a solution of mercuric chloride of the strength of 1 : 2000 for four hours.§

4. Immersion in a two per cent. solution of carbolie acid for four hours.

(b.) Outer garments of wool or silk, and similar articles, which would be injured by immersion in boiling water or in a disinfecting solution:

1. Exposure to dry heat at a temperature of 110° C. (230° Fahr.) for two hours.

(2.) Fumigation with sulphurous acid gas for at least twelve hours, the clothing being freely exposed, and the gas present in the disinfection chamber in the proportion of four volumes per cent.

(c.) Mattresses and blankets soiled by the discharges of the sick:

1. Destruction by fire.

\* The addition of an equal quantity of potassium permanganate as a deodorant, and to give color to the solution, is to be recommended (*Standard Solution No. 2.*)

† A concentrated solution containing four ounces of mercuric chloride and one pound of cupric sulphate to the gallon of water is recommended as a *standard solution*. Eight ounces of this solution to the gallon of water will give a dilute solution for the disinfection of excreta, containing about 1 : 500 of mercuric chloride, and 1 : 125 of cupric sulphate.

‡ For this purpose the chloride of lime may be diluted with plaster of Paris, or with cleau, well-dried sand, in the proportion of one part to nine.

§ The blue solution containing sulphate of copper, diluted by adding two ounces of the concentrated solution to a gallon of water, may be used for this purpose.

2. Exposure to super-heated steam—25 pounds pressure—for one hour. (Mattresses, to have the cover removed or freely opened.)
3. Immersion in boiling water for one hour.
4. Immersion in the blue solution (mercuric chloride and sulphate of copper) two fluid ounces to the gallon of water.

**FURNITURE AND ARTICLES OF WOOD, LEATHER AND PORCELAIN.\***

Washing, several times repeated, with:

1. Solution of mercuric chloride 1 : 1000. (The blue solution, four ounces to the gallon of water, may be used.)
2. Solution of chloride of lime, 1 per cent.
3. Solution of carbolic acid, 2 per cent.

**FOR THE PERSON.**

The hands and general surface of the body of attendants, of the sick, and of convalescents at the time of their discharge from hospital:

1. Solution of chlorinated soda diluted with nine parts of water (1 : 10.)
2. Carbolic acid, 2 per cent. solution.
3. Mercurie chloride, 1 : 1000; recommended only for the hands, or for washing away infectious malarial from a limited area, not as a bath for the entire surface of the body.

**FOR THE DEAD.**

Envelope the body in a sheet thoroughly saturated with:

1. Chloride of lime in solution, 4 per cent.
2. Mercuric chloride in solution, 1 : 500.
3. Carbolic acid in solution, 5 per cent.

**FOR THE SICK ROOM AND HOSPITAL WARDS.**

- (a.) While occupied, wash all surfaces with:
1. Mercuric chloride in solution, 1 : 1000. (The blue solution, containing sulphate of copper, may be used.)
  2. Chloride of lime in solution, 1 per cent.
  3. Carbolic acid in solution, 2 per cent.
- (b.) When vacated:
- Fumigate with sulphur dioxide for 12 hours, burning 3 pounds

\* For articles of metal use solution No. 3.

of sulphur for every 1000 cubic feet of air space in the room; then wash all surfaces with one of the above mentioned disinfecting solutions, and afterwards with soap and hot water; finally throw open doors and windows and ventilate freely.

#### FOR MERCHANTISE AND THE MAIIS.\*

The disinfection of merchandise and of the mails will only be required under exceptional circumstances; free aeration will usually be sufficient. If disinfection seems necessary, fumigate with sulphur dioxide, as recommended for woolen clothing, etc., will be the only practicable method of accomplishing it.

#### RAGS.

(a.) Rags which have been used for wiping away infectious discharges should at once be burned.

(b.) Rags collected for the paper-makers during the prevalence of an epidemic should be disinfected before they are compressed in bales by:

1. Exposure to super-heated steam (25 pounds pressure) for ten minutes.

2. Immersion in boiling water for half an hour.

(c.) Rags in bales can only be disinfected by injecting super-heated steam (50 pounds pressure) into the interior of the bale. The apparatus used must insure the penetration of the steam to every portion of the bale.

#### SHIPS.

(a.) Infected ships at sea should be washed in every accessible place, and especially the localities occupied by the sick, with:

1. Solution of mercuric chloride 1 : 1000. (The blue solution heretofore recommended may be used.)

2. Solution of chloride of lime 1 per cent.

3. Solution of carbolic acid 2 per cent.

The bilge should be disinfected by the *liberal* use of a strong solution of mercuric chloride. (The concentrated solution—"blue solution"—of this salt with cupric sulphate may be used.)

(b.) Upon the arrival at a quarantine station an infected ship should at once be fumigated with sulphurous acid gas, using three

\* In order to secure penetration of the envelope by the sulphur dioxide, all mail matter should be perforated by a cutting stamp before fumigating.

pounds of sulphur for every 1000 cubic feet of air space; the cargo should then be discharged on lighters; a liberal supply of the concentrated solution of mercuric chloride (4 oz. to the gallon) should be thrown into the bilge, and at the end of twenty-four hours the bilge water should be pumped out and replaced with *pure* sea water; this should be repeated. A second fumigation after the removal of the cargo is to be recommended; all accessible surfaces should be washed with one of the disinfecting solutions heretofore recommended, and subsequently with soap and hot water.

AS REVISED by the Committee, the following is the text of their paper for popular use and distribution:

#### DISINFECTION AND DISINFECTANTS.

The object of *disinfection* is to prevent the extension of infectious diseases by destroying the specific infectious material which gives rise to them. This is accomplished by the use of *disinfectants*.

There can be no partial disinfection of such material; either its infecting power is destroyed or it is not. In the latter case there is a failure to disinfect. Nor can there be any disinfection in the absence of infectious material.

It has been proved for several kinds of infectious material that its specific infecting power is due to the presence of living micro-organisms, known in a general way as "disease germs;" and practical sanitation is now based upon the belief that the infecting agents in all kinds of infectious material are of this nature. Disinfection, therefore, consists essentially in the destruction of disease germs.

Popularly, the term disinfection is used in a much broader sense. Any chemical agent which destroys or masks bad odors, or which arrests putrefactive decomposition is spoken of as a disinfectant. And in the absence of any infectious disease it is common to speak of disinfecting a foul cess-pool, or bad smelling stable, or privy vault.

This popular use of the term has led to much misapprehension, and the agents which have been found to destroy bad odors—*deodorizers*—or to arrest putrefactive decomposition—*antiseptics*—have been confidently recommended and extensively used for the destruction of disease germs in the excreta of patients with cholera, typhoid fever, etc.

The injurious consequences which are likely to result from such misapprehension and misuse of the word disinfectant will be appreciated when it is known that:

*Recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as antiseptics, are entirely without value for the destruction of disease germs.*

This is true, for example, as regards the sulphate of iron or copperas, a salt which has been extensively used with the idea that it is a valuable disinfectant. As a matter of fact, sulphate of iron in saturated solution does not destroy the vitality of disease germs or the infecting power of material containing them. This salt is, nevertheless, a very valuable antiseptic, and its low price makes it one of the most available agents for the arrest of putrefactive decomposition in privy vaults, etc.

*Antiseptic agents, however, exercise a restraining influence upon the development of disease germs, and their use during epidemics is to be recommended, when masses of organic material in the vicinity of human habitations can not be completely destroyed, or removed, or disinfected.*

While an antiseptic agent is not necessarily a disinfectant, all disinfectants are antiseptics; for putrefactive decomposition is due to the development of "germs" of the same class as that to which disease germs belong, and the agents which destroy the latter also destroy the bacteria of putrefaction, when brought in contact with them in sufficient quantity, or restrain their development when present in smaller amounts.

*A large number of the proprietary "disinfectants," so called, which are in the market, are simply deodorizers or antiseptics, of greater or less value, and are entirely untrustworthy for disinfecting purposes.*

Antiseptics are to be used at all times when it is impracticable to remove filth from the vicinity of human habitations, but they are a poor substitute for cleanliness.

During the prevalence of epidemic diseases, such as yellow fever, typhoid fever and cholera, it is better to use in privy vaults, cess-pools, etc., those antiseptics which are also disinfectants—*i.e.*, germicides; and when the contents of such receptacles are known to be infected this becomes imperative.

Still more important is the destruction at our sea-port quarantine stations of infectious material which has its origin outside of the boundaries of the United States, and the destruction, within our boundaries, of infectious material given off from the persons

of those attacked with any infectious disease, whether imported or of indigenous origin.

*In the sick room we have disease germs at an advantage, for we know where to find them, as well as how to kill them.* Having this knowledge, not to apply it would be criminal negligence, for our efforts to restrict the extension of infectious diseases must depend largely upon the proper use of disinfectants in the sick room.

### GENERAL DIRECTIONS.

*Disinfection of Excreta, etc.*—The infectious character of the dejections of patients suffering from cholera and from typhoid fever is well established ; and this is true of mild cases and of the earliest stages of these diseases as well as of severe and fatal cases. It is probable that epidemic dysentery, tuberculosis, and perhaps diphtheria, yellow fever, scarlet fever and typhoid fever may also be transmitted by means of the alvine discharges of the sick. It is, therefore, of the first importance that these should be disinfected. In cholera, diphtheria, yellow fever and scarlet fever, all vomited material should also be looked upon as infectious. And in tuberculosis, diphtheria, scarlet fever and infectious pneumonia, the sputa of the sick should be disinfected or destroyed by fire. It seems advisable also to treat the urine of patients sick with an infectious disease with one of the disinfecting solutions below recommended.

*Chloride of lime*, or bleaching powder, is perhaps entitled to the first place of disinfecting excreta, on account of the rapidity of its action. The following standard solution is recommended:

#### STANDARD SOLUTION NO. 1.

*Dissolve Chloride of Lime of the best quality\* in pure water, in the proportion of four ounces to the gallon.*

Use one quart of this solution for the disinfection of each discharge in cholera, typhoid fever, etc.† Mix well and leave in the

\* Good chlorido of lime should contain at least 25 per cent. of available chlorine. It may be purchased by the quantity at  $3\frac{1}{2}$  cents per pound. The cost of the standard solution recommended is therefore less than one cent a gallon. A clear solution may be obtained by filtration or by decantation, but the insoluble sediment does no harm, and this is an unnecessary refinement.

† For a very copious discharge use a larger quantity. For the disinfection of solid or semi-solid feces use a solution of twice this strength—8 ounces to a gallon of water—in the proportion of one quart for every 4 ounces of material to be disinfected.

vessel for at least one hour before throwing into privy vault or watercloset. The same directions apply for the disinfection of vomited matters. Infected sputum should be discharged directly into a cup half full of the solution.

#### STANDARD SOLUTION NO. 2.

*Dissolve Corrosive Sublimate and Permanganate of Potash in pure water, in the proportion of two drachms of each salt to the gallon.*

This is to be used for the same purposes, and in the same way as *Standard Solution No. 1*. It is equally effective, but it is necessary to leave it for a longer time in contact with the material to be disinfected—at least four hours. The only advantage which this solution has over the chloride of lime solution consists in the fact that it is odorless, while the odor of chlorine in the sick room is considered by some persons objectionable. The cost is a little more.\* It must be remembered that this solution is highly poisonous. It is proper, also, to call attention to the fact that *it will injure lead pipes if passed through them in considerable quantities.*

It will be best to empty the vessel containing excreta and disinfectant into an earthen jar or wooden vessel, and to leave it for twenty-four hours, at the end of which time it may be thrown into a privy vault, or into a hole in the ground excavated for this special purpose.

*Disinfection of the Person.*—The surface of the body of a sick person, or of his attendants, when soiled with infectious discharges, should be at once cleansed with a suitable disinfecting agent. For this purpose solution of chlorinated soda (*liquor sodæ chlorinatus*) diluted with nine parts of water, or *Standard Solution No. 1* diluted with three parts of water, may be used. A two per cent. solution of carbolic acid is also suitable for this purpose, and under proper supervision the use of a solution of corrosive sublimate—1 : 1000—is to be recommended.

In diseases like small-pox and scarlet fever, in which the infectious agent is given off from the entire surface of the body, occasional ablutions with solution of chlorinated soda diluted with

\* Corrosive sublimate costs about 70 cents a pound, and permanganate of potash 65 cents a pound, by a single pound. This makes the cost of *Standard Solution No. 2* a little more than two cents a gallon.

twenty parts of water, will be more suitable than the stronger solution above recommended.

In all infectious diseases the body of **THE DEAD** should be enveloped in a sheet saturated with *Standard Solution No. 1*, or with a 5 per cent. solution of carbolic acid, or a 1 : 500 solution of corrosive sublimate.

*Disinfection of Clothing.*—Boiling for half an hour will destroy the vitality of all known disease germs, and there is no better way of disinfecting clothing or bedding which can be washed than to put it through the ordinary operations of the laundry. No delay should occur, however, between the time of removing soiled clothing from the person or bed of the sick and its immersion in boiling water, or in one of the following solutions; and no article should be permitted to leave the infected room until so treated:

#### STANDARD SOLUTION NO. 3.

*Dissolve four ounces of Corrosive Sublimate and one pound of Sulphate of Copper in a gallon of water.*

Two fluid ounces of this standard solution to the gallon of water will make a suitable solution for the disinfection of clothing. The articles to be disinfected must be thoroughly soaked with the disinfecting solution and left in it for at least two hours, after which they may be wrung out and sent to the wash.

[N. B. *Solutions of corrosive sublimate should not be placed in metal receptacles*, for the salt is decomposed and the mercury precipitated by contact with copper, lead or tin. A wooden tub or earthen crock is a suitable receptacle for such solutions.]

When diluted as directed this solution may be used without danger from poisoning through the medium of clothing immersed in it, or by absorption through the hands in washing. A poisonous dose could scarcely be swallowed by mistake, owing to the metallic taste of the solution, and the considerable quantity which would be required to produce a fatal effect.

Clothing may also be disinfected by immersing it for four hours in a two per cent. solution of carbolic acid.

Clothing or bedding which cannot be washed or subjected to the action of steam, may be disinfected by exposure to dry heat in a properly constructed disinfecting chamber for three or four hours. A temperature of 230 Fah. should be maintained during this time, and the clothing must be freely exposed—*i. e.*, not

folded or arranged in piles or bundles, for the penetrating power of dry heat is very slight.\*

The temperature above mentioned will not destroy the *spores* of bacilli—e. g., of the *anthrax bacillus*, but is effective for the destruction of all disease germs which do not form spores; and there is good reason to believe that this list includes small-pox, cholera, yellow fever, diphtheria, erysipelas, puerperal fever and scarlet fever (?). Moist heat is far more effective, and it is demonstrated that ten minutes exposure to steam at a temperature of 230° Fahr., will destroy all disease germs, including the most refractory spores.

In the absence of a suitable chamber for the use of dry heat, fumigation with sulphurous acid gas may be resorted to. The room in which disinfection is practiced should be hermetically closed to prevent the escape of the gas, and three pounds of sulphur should be burned in it for every 1000 cubic feet of air space. Expose the articles to be disinfected as freely as possible by hanging them up in the disinfecting chamber, and leave them at least twelve hours subjected to the action of the sulphurous acid gas.

Soiled mattresses, pillows, feather beds and other articles of this nature cannot be effectually disinfected by sulphur fumigation, owing to the fact that the gas does not penetrate to their interior in sufficient amount. For articles of this kind, and in general for articles of little value, which have been soiled by the discharges of the sick, destruction by fire will be advisable.

*Disinfection of the Sick Room.*—In the sick room no disinfectant can take the place of free ventilation and cleanliness. It is an axiom in sanitary science that *it is impracticable to disinfect an occupied apartment*, for the reason that disease germs are not destroyed by the presence in the atmosphere of any known disinfectant in respirable quantity. Bad odors may be neutralized, but this does not constitute disinfection in the sense in which the term is here used. These bad odors are, for the most part, an indication of want of cleanliness, or of proper ventilation; and it is better to turn contaminated air out of the window, or up the chimney, than to attempt to purify it by the use of volatile chemical agents, such as carbolic acid, chlorine, etc., which are all more or less offensive to the sick, and are useless so far as disinfection—properly so-called—is concerned.

\*The limitations with reference to the use of dry heat as a disinfectant are stated in the paper on Dry Heat.

*When an apartment which has been occupied by a person sick with an infectious disease is vacated, it should be disinfected.*

The object of disinfection in the sick room is, mainly, the destruction of infectious material attached to surfaces, or deposited as dust upon window-ledges, in eaves, etc. If the room has been properly cleansed and ventilated while still occupied by the sick person, and especially if it was stripped of carpets and unnecessary furniture at the outset of his attack, the difficulties of disinfection will be greatly reduced.

All surfaces should be thoroughly washed with *Standard Solution No. 1*, diluted with three parts of water, or with 1 : 1000 solution of corrosive sublimate. *Standard Solution No. 3*, diluted in the proportion of four ounces to the gallon of water, may be used.

The walls and ceiling, if plastered, should be brushed over with one of these solutions and subsequently washed over with a lime wash.

Especial care must be taken to wash away all dust from window-ledges and other places where it may have been settled, and to thoroughly cleanse eaves and out-of-the-way places. After this application of the disinfecting solution, and an interval of twenty-four hours or longer for free ventilation, the floors and wood-work should be well scrubbed with soap and hot water, and this should be followed by a second more prolonged exposure to fresh air, admitted through open doors and windows.

As an additional precaution, fumigation with sulphurous acid gas is to be recommended, especially for rooms which have been occupied by patients with small-pox, scarlet fever, diphtheria, typhus fever and yellow fever. But fumigation with sulphurous acid gas alone, as commonly practiced, cannot be relied upon for disinfection of the sick room and its contents, including bedding, furniture, infected clothing, etc., as is popularly believed.

When fumigation is practiced it should precede the general washing with a disinfecting solution, heretofore recommended.

*To insure any results of value it will be necessary to close the apartment to be disinfected as completely as possible by stopping all apertures through which the gas might escape, and to burn not less than three pounds of sulphur for each thousand cubic feet of air-space in the room. To secure complete combustion of the sulphur it should be placed in powder or in small fragments, in a shallow iron pan, which should be set upon a couple of briks in*



a tub partly filled with water, to guard against fire. The sulphur should be thoroughly moistened with alcohol before igniting it.

*Disinfection of privy vaults, cess-pools, etc.* When the excreta (not previously disinfected) of patients with cholera or typhoid fever, have been thrown into a privy vault this is infected, and disinfection should be resorted to as soon as the fact is discovered, or whenever there is reasonable suspicion that such is the case. It will be advisable to take the same precautions with reference to privy vaults into which the excreta of yellow-fever patients have been thrown, although we do not definitely know that this is infectious material.

The most trustworthy agent for this purpose is corrosive sublimate.

The amount used must be proportioned to the amount of material to be disinfected.

*Use one pound of corrosive sublimate for every five hundred pounds (estimated) of fecal matter contained in the vault.*

*Solution No. 3*, diluted with three quarts of water may be used. The diluted solution should be applied in the proportion of one gallon to every four gallons (estimated) of the contents of the vault.

All exposed portions of the vault, and the wood-work above it, should be thoroughly washed down with the disinfecting solution.

To keep a privy vault disinfected during the progress of an epidemic, sprinkle chloride of lime freely over the surface of its contents daily. Or if the odor of chlorine is objectionable, apply daily four or five gallons of *Standard Solution No. 2*, which should be made up by the barrel, and kept in a convenient location, for this purpose.

*Disinfection of ingesta.*—It is well established that cholera and typhoid fever are very frequently, and perhaps usually, transmitted through the medium of infected water or articles of food, and especially milk. Fortunately we have a simple means at hand for disinfecting such infected fluids. This consists in the application of heat. *The boiling temperature maintained for half an hour kills all known disease germs.* So far as the germs of cholera, yellow fever, and diphtheria are concerned, there is good reason to believe that a temperature considerably below the boiling point of water will destroy them. But in order to keep on the safe side it is best not to trust anything short of the boil-

ing point ( $212^{\circ}$  Fah.) when the object is to disinfect food or drink which is open to the suspicion of containing the germs of any infectious disease.

During the prevalence of an epidemic of cholera it is well to boil all water for drinking purposes. After boiling, the water may be filtered, if necessary to remove sediment, and then cooled with *pure* ice if desired.

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NOTE.—Recent experiments made by Dr. Sternberg make it apparent that the complete sterilization of large masses of fecal matter in privy vaults would be a difficult and expensive undertaking, if not entirely impracticable. It is therefore of prime importance that infectious material should be destroyed before it is thrown into a receptacle of this kind. But it seems also important that during the prevalence of an epidemic the contents of privy vaults should be rendered unsuitable for the development of disease germs by the use of antiseptics, and that, so far as practicable, infectious material, not previously disinfected, should be destroyed *in situ*. A thorough disinfection of exposed surfaces soiled with the discharges of those who have recently frequented the place and of the exposed surface of the material in the vault is perhaps all that will be accomplished by the use of a solution of the bichloride of mercury as recommended. But it is doubtful whether more would be accomplished by the use of any other disinfectant, in reasonable quantity, and the superior potency of the bichloride as a germicide and antiseptic seems to the committee to justify the recommendation made with reference to its use in privy vaults. The liberal use of good disinfecting powder upon the surface of such masses of organic material is also to be recommended, and for this purpose chloride of lime diluted with some inert substance is, perhaps, the most useful agent, on the score of economy and efficiency.



